To all whom it may concern:

Be it known that I, Daniel J. Hafford, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful improvement in Hand-Fed Hammer Drills, of which the following is a full, clear, and exact description.

This invention relates to a hand fed stoping drill of the hammer piston type, and has for its chief objects to provide a feed which is more satisfactory than those used heretofore, which permits more rapid work, and which possesses also the element of safety in the sense that there is eliminated danger of injury to the operator resulting from the breakage of the drilling steel employed in a stoping drill which is air fed. Heretofore, stoping drills of the hammer piston type have either been air fed through the medium of a piston engaging in an air feed cylinder connected to the hammer cylinder, or the drill has been supported by a column, the drill being mounted in a cradle removable in a guide shell which is rigid with the column.

The use of an air feed drill is open to the objection that should the drilling steel break, the operator is in great danger of serious injury due to the air pressure on the piston of the feeding mechanism and the lack of sudden and positive control when breakage occurs.

The second method of feeding, wherein the drill is supported in a column generally interposed between the roof and bottom of the stope, is objectionable not only because the construction is cumbersome, heavy and expensive, but because it does not lend itself torapidity of work.

These objections are overcome by my invention which comprises the combination of a stoping drill of the hammer piston type with a feed screw operatively connected to the hammer cylinder in line with its axis, and in its more specific aspect the invention resides as well in certain details of the feeding mechanism, as the latter is preferably constructed and applied to the hammer cylinder or body of the drill proper.

In the accompanying sheet of drawings wherein I have shown an embodiment of my invention which operates with high efficiency, Fig. 1 is a vertical sectional view of a stoping drill equipped with my invention; and Fig. 2 is an enlarged view of the feeding mechanism partly in section and partly in elevation, but showing the feed screw elevated or in a position corresponding to maximum feed of the drilling steel.

The details of the drill proper are immaterial to my invention, and such details will be referred to only briefly. In the drill as here shown, 10 represents a hammer cylinder containing a reciprocating hammer piston 11 which is adapted to be reciprocated back and forth in the cylinder, and the blow of which is transmitted either through a tappet such as shown at 12, or directly to the drilling steel 13 mounted in a rotary chuck 14, seated in a chuck housing 15. The chuck housing is flexibly connected through the medium of chuck bolts 16 and chuck bolt springs 17 to the end of the hammer cylinder 10, there being interposed between the chuck housing and hammer cylinder a piston bearing 18 and in this instance also steel rotating mechanism of well-known type, and including a ratchet ring 19. As it is immaterial by what means the drilling steel is rotated, i.e. whether automatically or manually, this automatic rotating mechanism is not shown in detail and need not be further referred to.

At the base of the hammer cylinder 10 is a so-called valve block 20 and valve block button 21, containing a valve to which air is supplied under the control of a valve handle 22 from an air supply pipe 23, these latter parts being carried by a so-called hammer head 24, to which the feeding mechanism is directly applied, this hammer head constituting in effect part of the hammer cylinder.

Before taking up the feeding mechanism it might be mentioned that with this type of drill, water is sometimes fed centrally through the drill, and in this instance it is designed to be supplied by a pipe 25, and conducted by a central tube up through the piston to the drilling steel which will have an opening at its drilling end for the discharge of the water.

Coming now to the part which more directly involves my invention, I provide a feed screw 26 directly in line with the axis of the drill, and attach it to the hammer cylinder or head 24, thereby producing a
new method of feed and a new feed construction for a stoping drill of the reciprocating hammer piston type.

This feed screw is attached to the head 24 by having its inner end 26 screwed into a sleeve-like extension 24 of the head, and it is secured in position by a locknut 29 which engages the end of this extension. At the bottom or outer end of the feed screw 10 is a center 27 which is mounted in a member 28 carried by a sleeve 29 surrounding the lower portion of the feed screw and attached to a housing 30 containing the actuating mechanism for the feed screw, which housing surrounds the latter and carries a key 31 engaging in a key-way of the screw and serving to hold the screw and housing against relative rotation.

Supported in the housing through ball-bearings 32 is a combined bevel gear and nut 33 threaded interiorly and engaging the threads of the screw so that as the combined gear and nut 33 is rotated the screw will be fed through the housing 30 either up or down, depending upon the direction of rotation of the part 33. This combined gear and nut 33 is engaged by a second bevel gear 34 mounted on a short shaft 35 rotatably supported in a lateral extension 36 of the housing and projecting at right angles therefrom. On the outer end of this shaft is provided a handle 37 which the operator turns in one direction to feed the drilling steel as the drilling progresses, and in the opposite direction when the operator desires to withdraw the drilling steel from the hole which he has drilled. When the screw is lowered its maximum amount, its lower end engages the member 28 carrying the center, and the screw can be moved upwardly through the housing until a shoulder in the form of a nut 35 on the lower end of the screw engages an internal shoulder 39 of the housing 30. Fig. 1 shows the screw in its lowest position, and Fig. 2 in its elevated position. It will be understood that when the screw is fed upward, the entire drill proper is elevated and the distance between the drill and housing 30 is varied, there being no connection between them other than that afforded by the screw itself.

With this stoping drill the operator controls the rate of feed thereby providing a better and safer feed than the automatic air feed, and at the same time there is provided a compact construction far simpler than that embodied in a stoping drill mounted in a cradle movable along a drill supporting column.

Furthermore, the screw feed mechanism provided on the specific type of tool herein described, renders the feeding operation remarkably easy. Due to the vibration set up by the hammer piston operating from one thousand to two thousand times per minute the feed screw actually floats in the feed nut, making it possible to turn the feed handle without appreciable resistance while the machine is in operation.

Having described my invention, I claim:

1. In a stoping drill, a drill body including a hammer cylinder containing a fluid actuated reciprocating hammer piston adapted to impart a blow to a drilling steel, in combination with a feed comprising a screw rigidly connected to the drill body in line with the axis thereof, means for actuating the screw, and thrust receiving means at the free end of said screw.

2. In a stoping drill, a drill body including a hammer cylinder containing a fluid actuated reciprocating hammer piston adapted to impart a blow to a drilling steel, in combination with a feed comprising a screw having a fixed operative connection with one end of the drill body and means separate from the latter for bodily elevating or lowering the screw and drill body.

3. In a stoping drill, a drill body including a hammer cylinder containing a fluid actuated reciprocating hammer piston adapted to impart a blow to a drilling steel, in combination with a feed comprising a screw having at one end a fixed connection with the drill body, a housing surrounding the screw and having means for feeding the screw endwise through the housing.

4. In a stoping drill, a drill body including a hammer cylinder containing a fluid actuated reciprocating hammer piston adapted to impart a blow to a drilling steel, in combination with a feed comprising a screw rigidly connected at one end to the drill body, a housing surrounding the screw, and carrying a center, a nut journaled in the housing and engaging the screw, and means projecting from the housing for rotating the nut.

5. In a stoping drill, a drill body including a hammer cylinder containing a fluid actuated reciprocating hammer piston adapted to impart a blow to a drilling steel, in combination with a feed comprising a screw rigidly connected at one end to the drill body, a housing surrounding a portion of the screw, means for preventing relative rotation between the screw and housing, and means for moving the screw endwise through the housing comprising a shaft extending laterally from the housing and engaging the shaft to the screw including an internally threaded gear surrounding and engaging the screw so as to serve as a nut.

In testimony whereof, I have affixed my signature.

Daniel J. Hafford.